
Combination of ScaRaB-CERE₁ with Meteosat-5 : time interpolat deep convection studies

CERES / METEOSAT-5 : characteris

METEOSAT-5 CALIBRATION

provided by EUMETSAT , L: $\text{Wm}^{-2}\text{sr}^{-1}$

IR Calibration

01/03/2000 L = 0.07017 (Count -5)

29/03/2000 L = 0.06947 (Count -5)

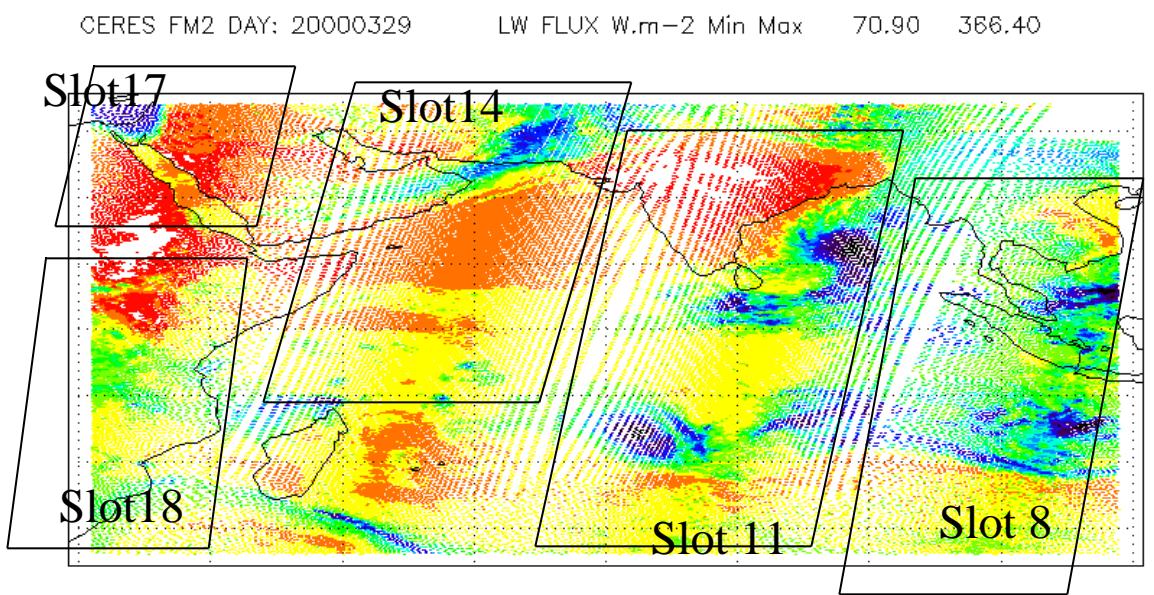
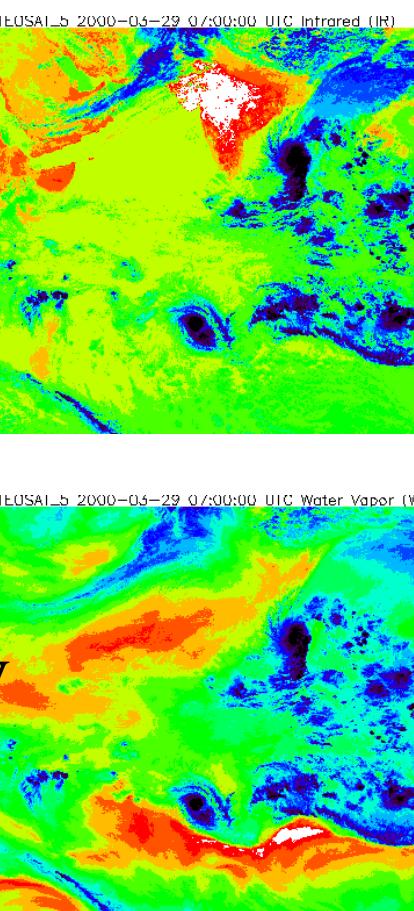
WV Calibration

01/03/2000 L=0.00866(Count-6)

29/03/2000 L=0.00876(Count-6)

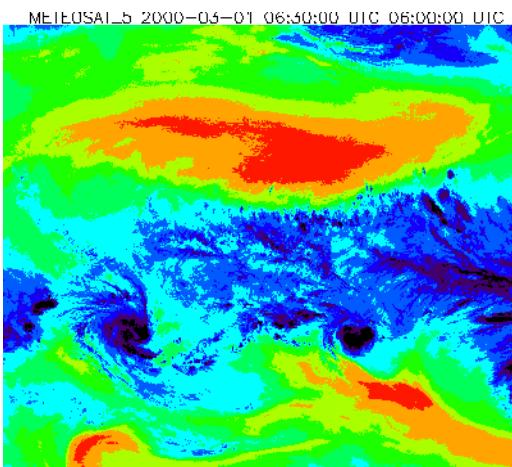
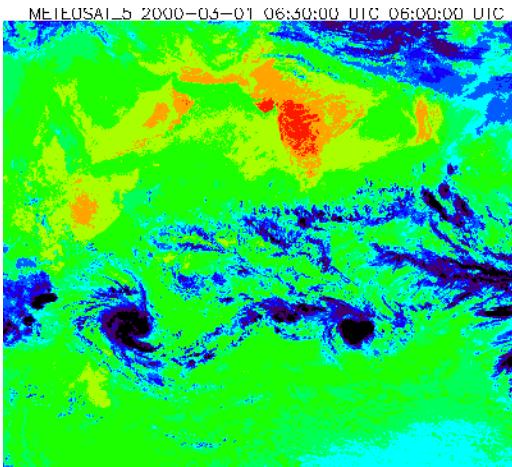
Visible Calibration : not provided

March 29, 2000, slot14, 6:30-7:00 UT

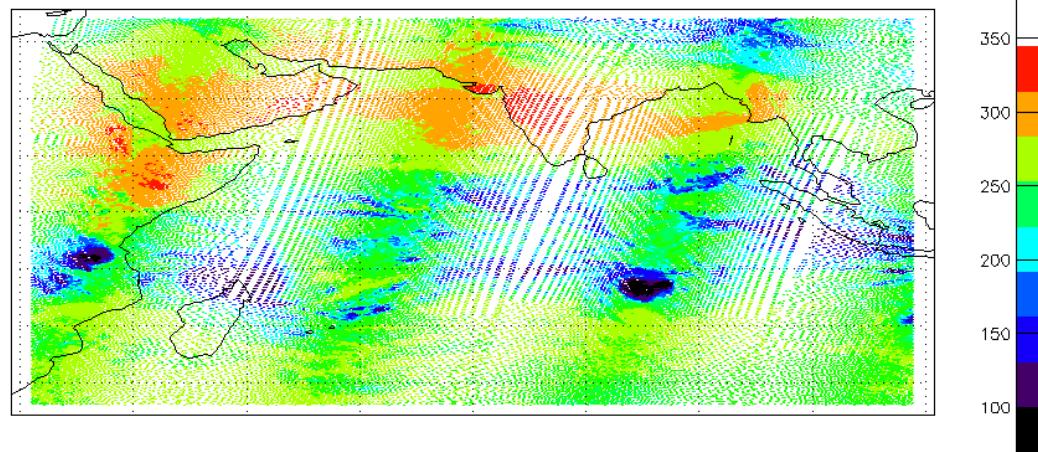


CERES/Terra March 29 (centers of
+ approximate Meteosat slot matching)

March 01, 2000, slot14, 6:30-7:00 UT



CERES FM2 DAY: 20000301 LW FLUX W.m⁻² Min Max 69.40 405.80



CERES/Terra March 01 (centers of fo

Flux LW

$$\text{Flux} = A0 + A1 \cdot \text{IR} + A2 \cdot \text{IR}^3 + A3 \cdot \text{IR}/\cos(\text{zen}) + A4 \cdot \text{WV} + A5 \cdot \text{WV}^2$$

IR = Meteosat IR Radiance, WV = Water Vapor channel

(based on Cheruy et al., JGR, 1991)

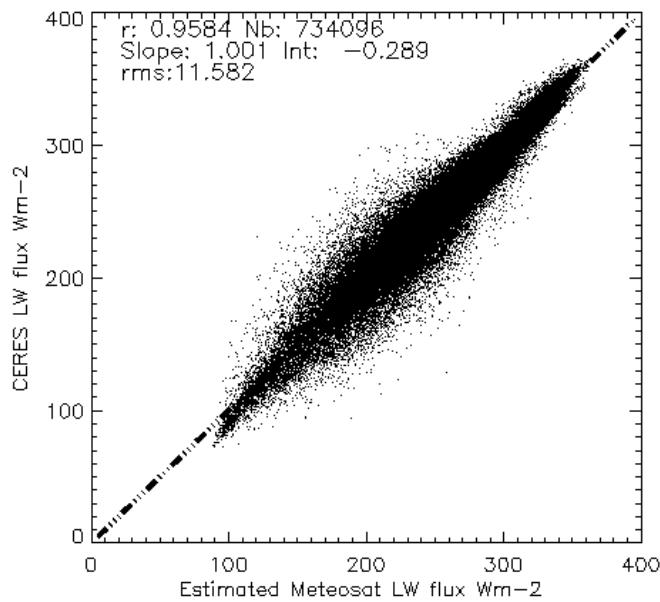
Regression Coeff	A0	A1	A2	A3	A4	A5
caRaB Mars 1999	65.48	14.19	-.0080	1.84	61.33	11.04

(Roca et al., JGR, in press)

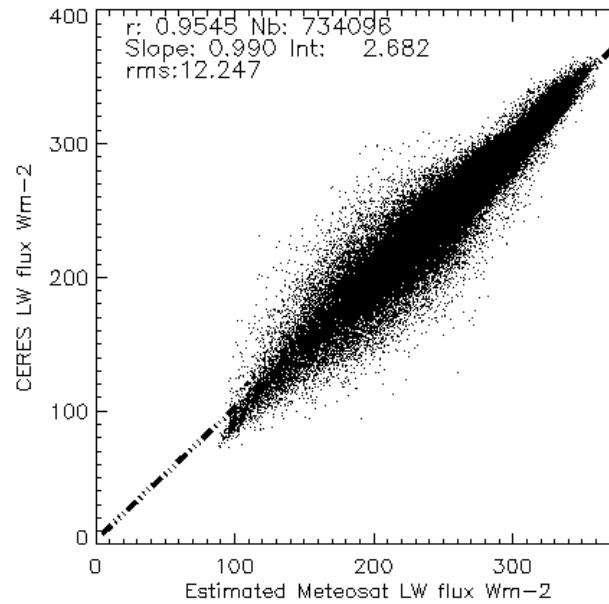
Application to CERES ES8 data

2000, March 1 and 29

meteosat
average



Meteosat
Average
5x5



Remarkable consistency between the CERES /Terra 2000 LW fluxes and
the Meteosat-5 LW flux estimations (based on ScaRaB 1999 comparisons)

TERRA – FM2 2000 269.81 0.965 +0.68 (+0.10) 17.83 (5.56) 1 061 513
03 1,10,20,29

TERRA – FM1 2000 271.13 0.967 +1.92 (+0.52) 15.34 (5.48) 1 032 925
03 1,10,20,29

TRMM – 1999 03 all 268.64 0.937 2 173 246

365 805

TRMM – 2000 03 29 270.82 0.932 +1.961 (+0.59) 16.87 (7.52) 373 480



M. Viollier et al, LMD/CNRS

2002/05/15 CERES-26

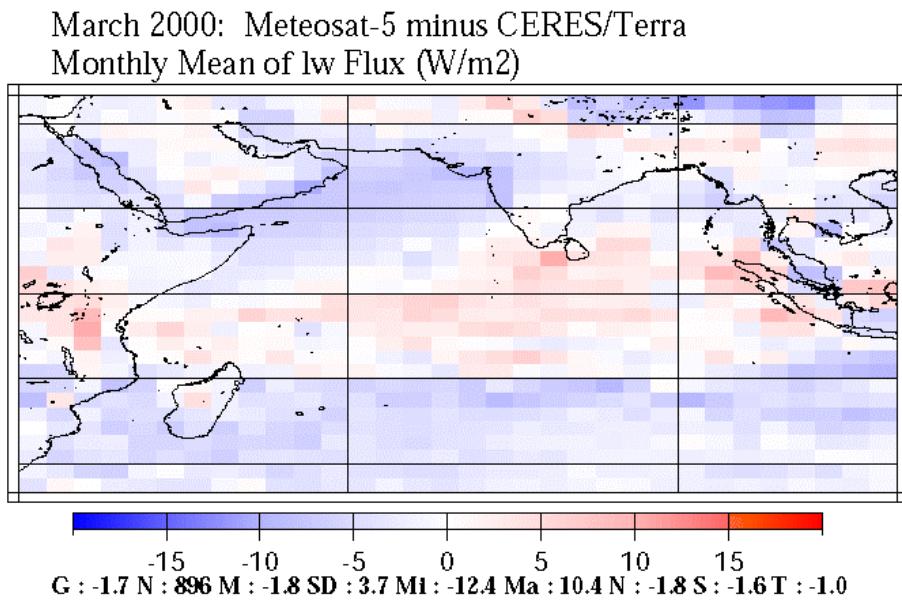
Consistency of LW Flux Estimations

Consistency to within the 1% level

This cross-checking exercise includes

- 1 the CERES PFM (TRMM) ES8 flux estimates
- 2 the CERES PFM (Terra) ES8 flux estimates
- 3 the ScaRaB flux estimates
- 4 the IR and WV Meteosat radiances calibration
- 5 the Meteosat flux conversions.

LW Montly means : Meteosat minus CERES



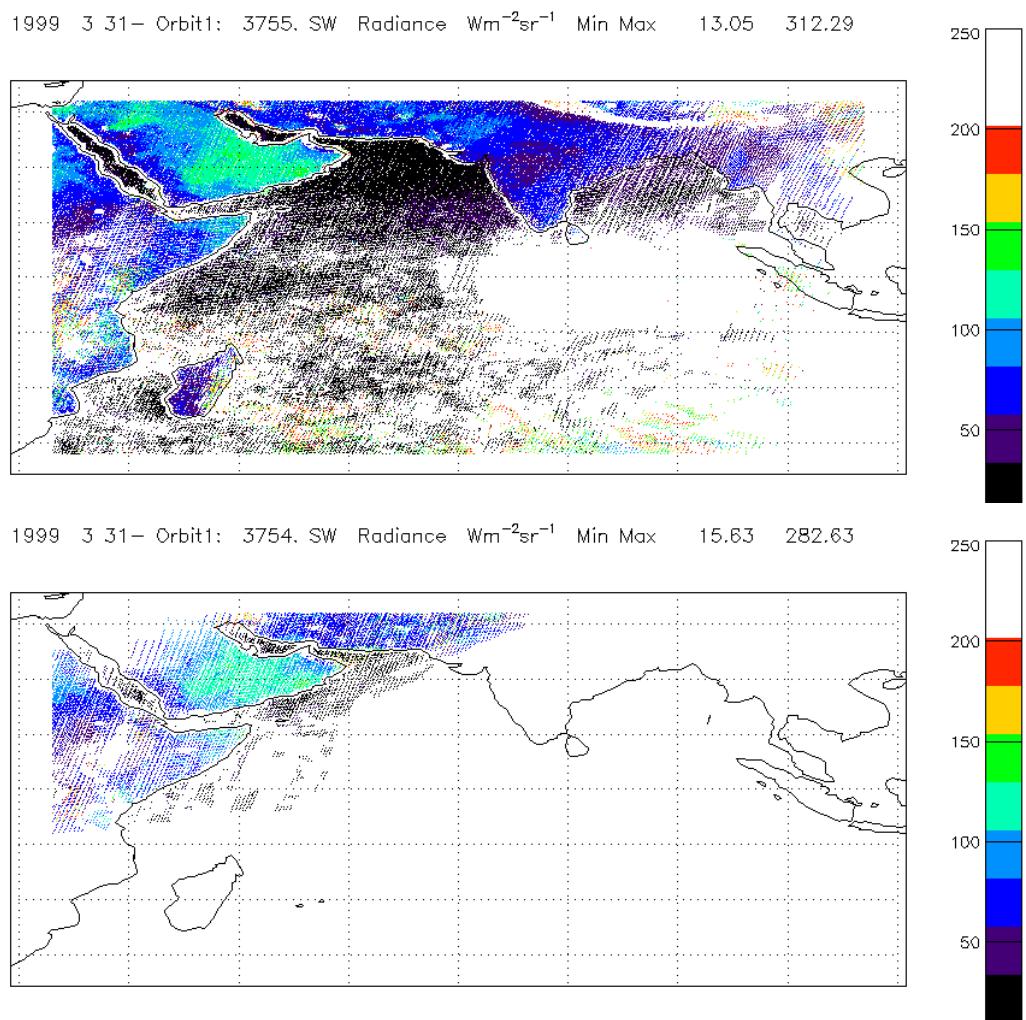
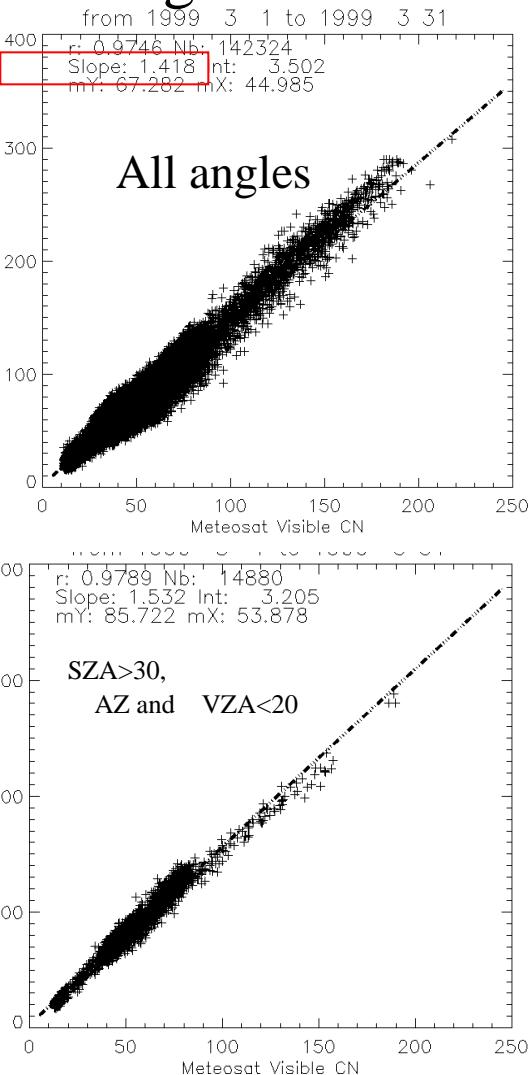
LW conclusion:

Confirmation
of this map (presented
Brussels)

SW Stu

ScaRaB-2, March 1999

Homogeneous areas ($sd < 20\%$, 50 km)

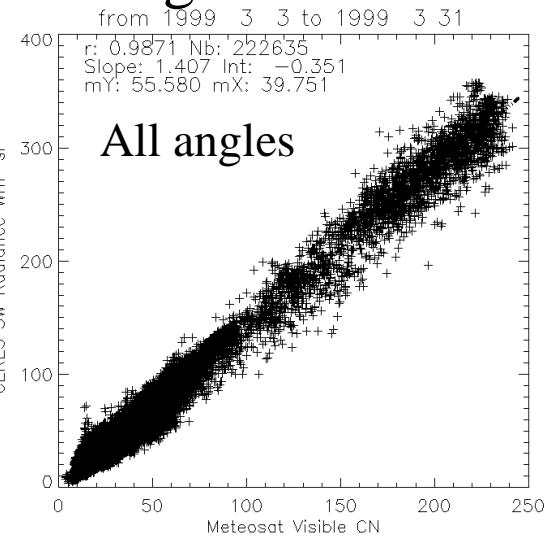


2002/05/15 CERES-26

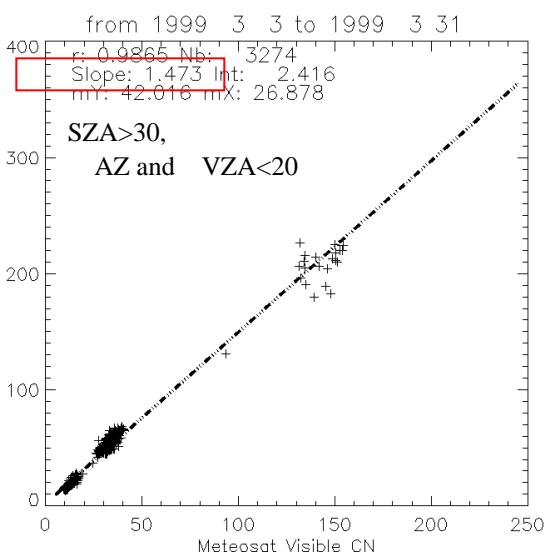
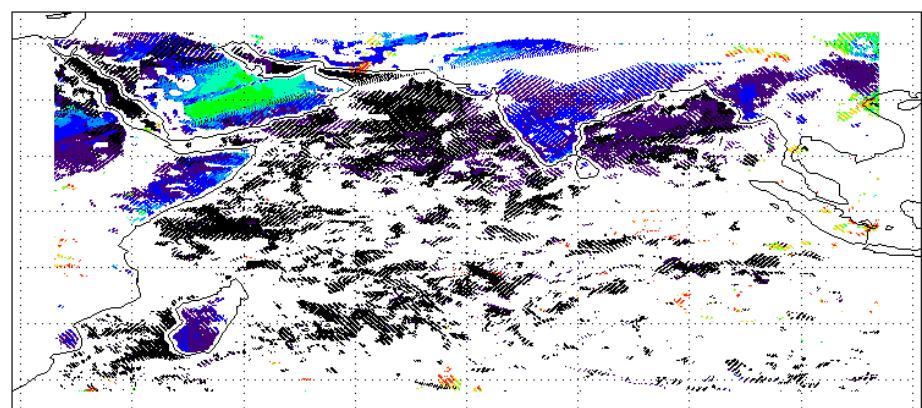
M. Viollier et al, LMD/CNRS

CERES/TRMM, March 1999 ('transient' for 18 days)

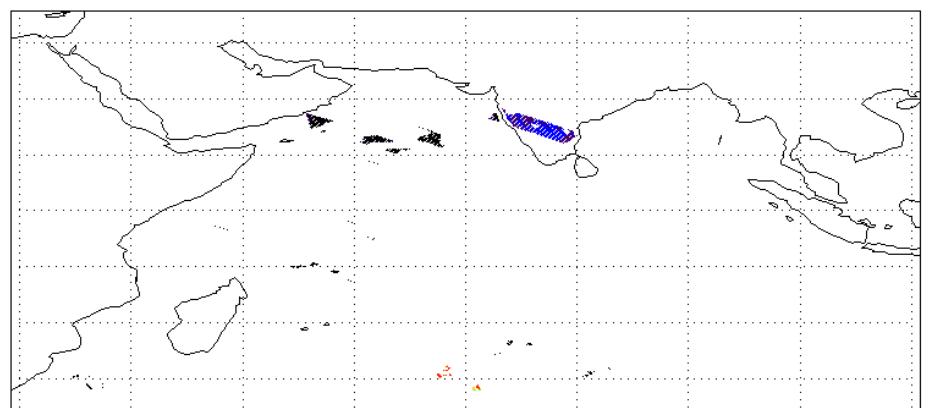
Homogeneous areas ($\text{sd} < 10\%$, 50 km) – nearest pixel –



1999 3 31 – SW Radiance $\text{Wm}^{-2}\text{sr}^{-1}$ Min Max 5.38 342.44

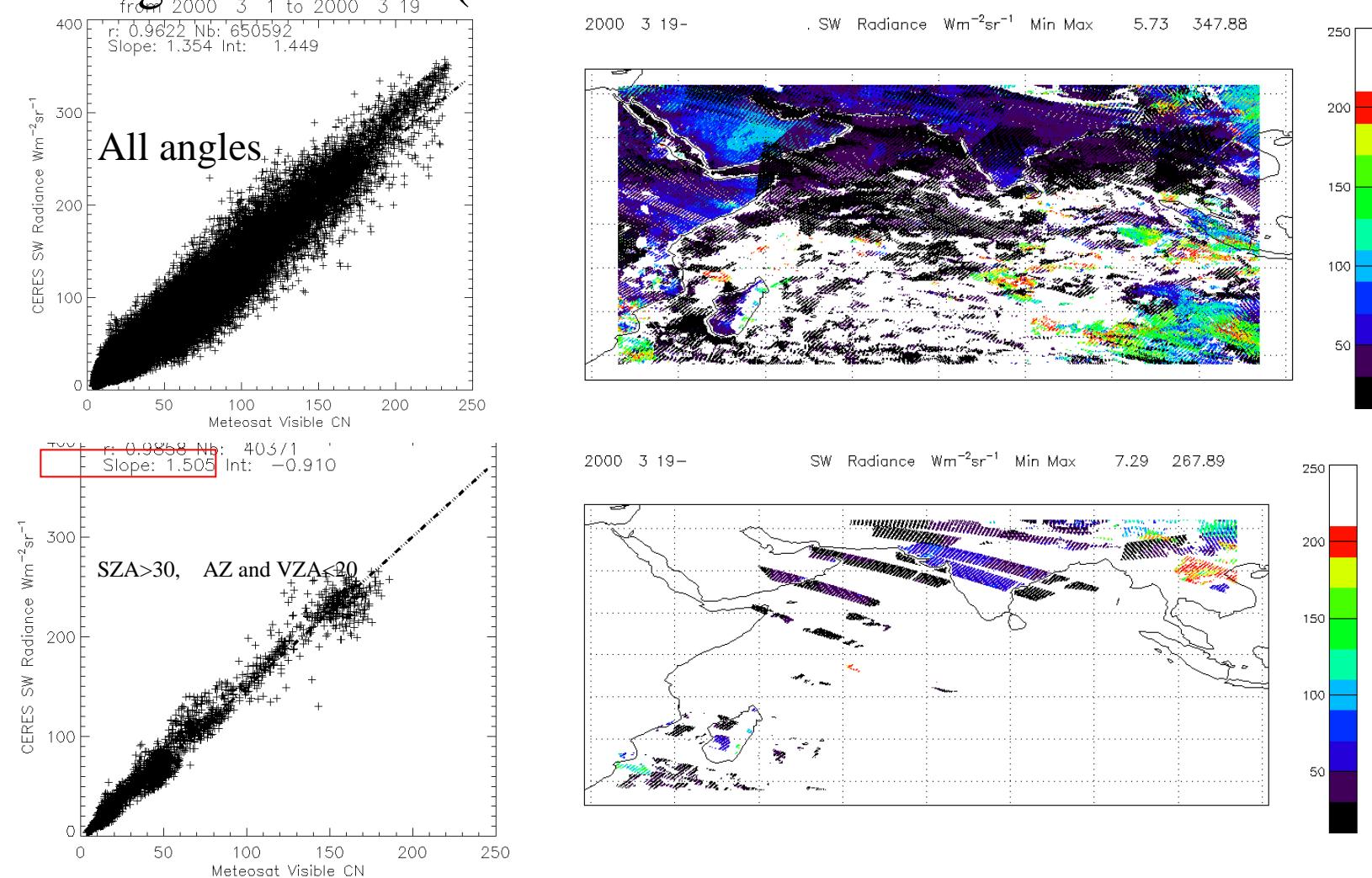


1999 3 31 – SW Radiance $\text{Wm}^{-2}\text{sr}^{-1}$ Min Max 18.97 285.21



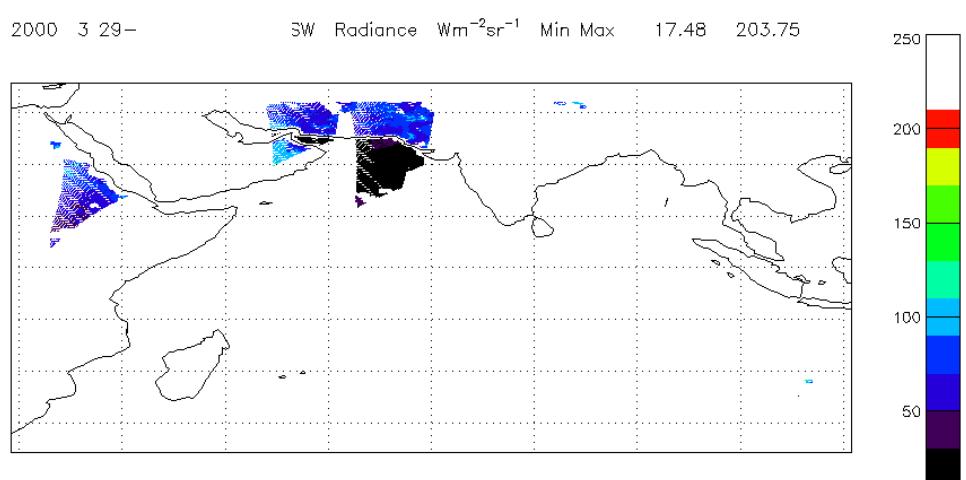
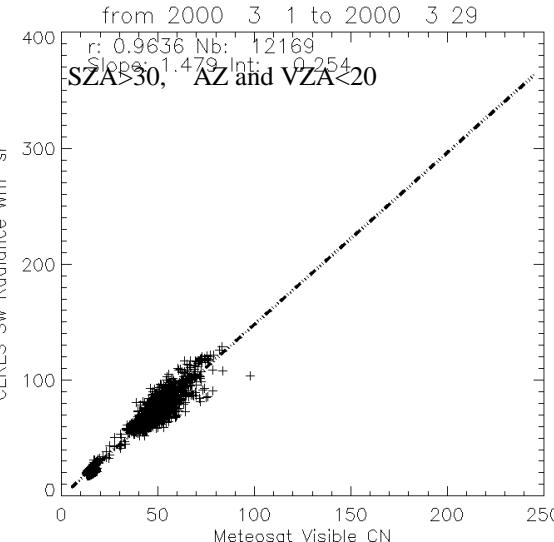
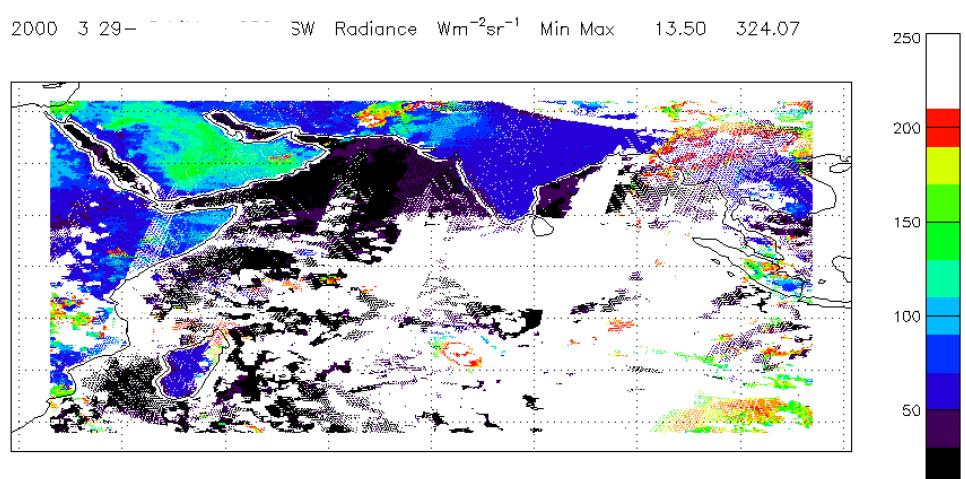
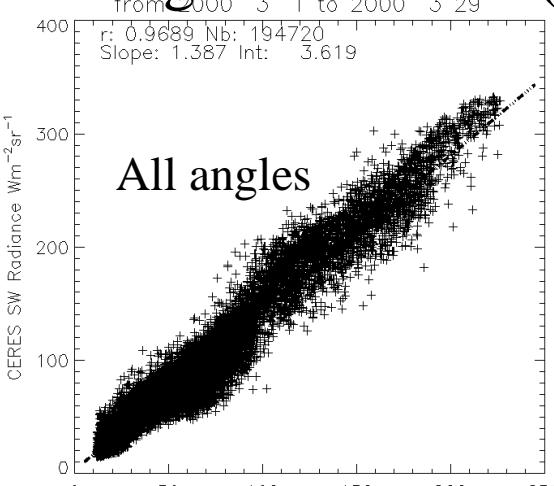
CERES/TRMM, 1,4,7,10,13,16,19 March 2000

Homogeneous areas ($sd < 10\%$. 50 km) – nearest pixel -



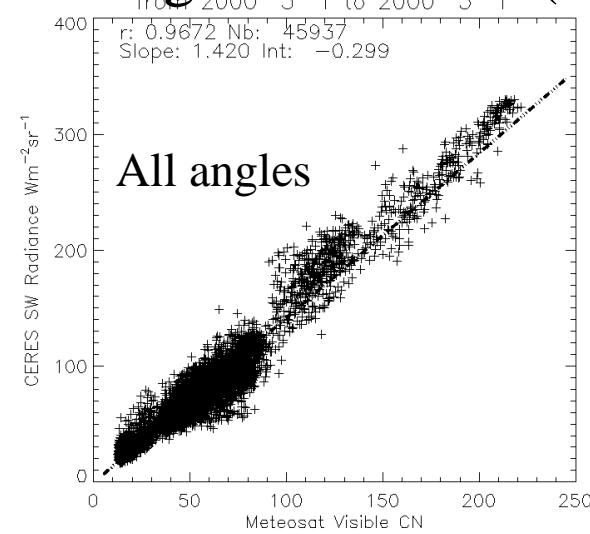
CERES/Terra, FM2, 1, 10, 20, 29 March 2000

Homogeneous areas ($sd < 10\%$. 50 km) – nearest pixel -

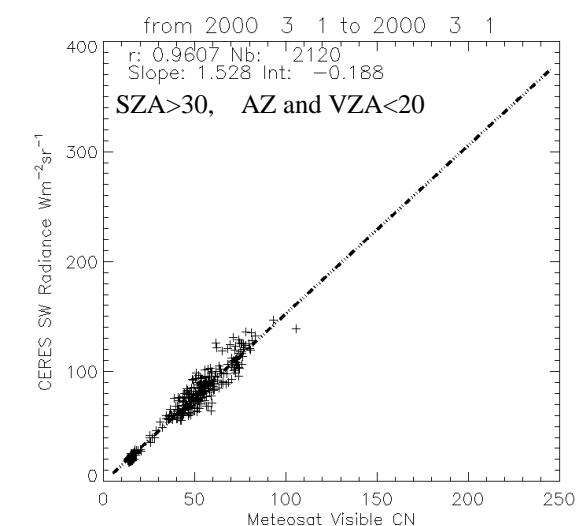
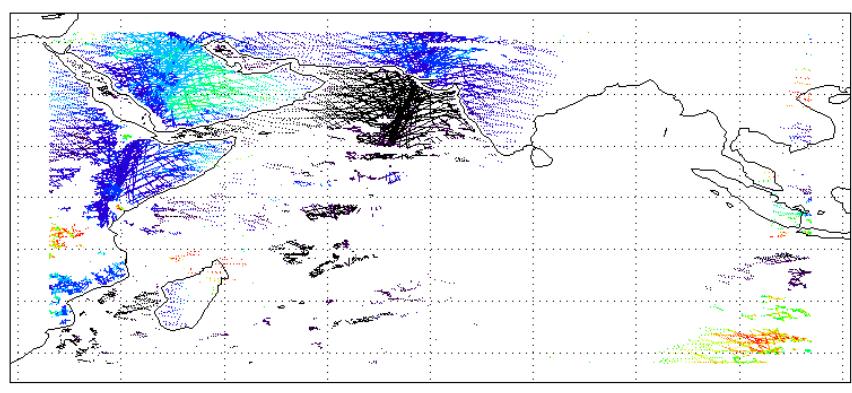


CERES/Terra, FM1, 1 March 2000

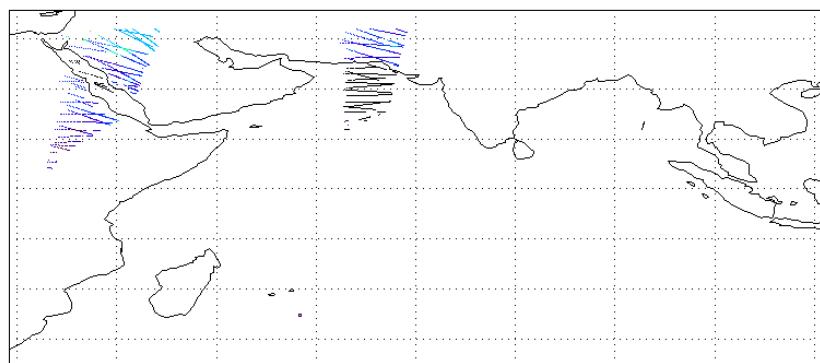
Homogeneous areas ($sd < 10\%$, 50 km) – nearest pixel –



2000 3 1 – 1 SW Radiance $\text{Wm}^{-2}\text{sr}^{-1}$ Min Max 14.45 323.37



2000 3 1 SW Radiance $\text{Wm}^{-2}\text{sr}^{-1}$ Min Max 19.16 195.12



SW radiance/ Meteosat CN summary

ng. Bin SZA>30, AZ and VZA<20

rch 1999 d 2000	Mean Radiance	Population Size	R	Slope	Intercept	Rad for CN=50	Difference/ mean (%)
RaB 1999	85.72	14 880	0.978	1.532	3.205	79.80	+3.5
M 1999	42.02	3274	0.986	1.473	2.416	76.07	0
M 2000		40371	0.986	1.505	-0.910	74.34	-2.4
I2 2000		12169	0.964	1.479	0.254	74.20	-2.5
I12000 1day		2120	0.961	1.528	-0.299	76.10	0

all angles

Mean 76.1

rch 1999 d 2000	Mean Radiance	Population Size	R	Slope	Intercept	Rad for CN=50	Difference/ mean (%)
aRaB 1999	67.28	142 324	0.975	1.418	3.502	74.4	+4
M 1999	55.58	222 635	0.987	1.407	-0.351	70.0	-2
M 2000		650592	0.962	1.354	1.449	69.1	-3.5
I2		194720	0.97	1.387	3.619	73.0	+2.5
I1 2000 1day		45937	0.967	1.420	-0.118	70.9	-0.8

SW current conclusions

5 sets of complementary data (ScaRaB-2, Ceres-PFM-1999,
Ceres-PFM-2000, CERES-FM1-2000, CERES-FM2-2000)
associated with Meteosat 5 over INDOEX Area.

agreement at the 5% level

« all angles » minus « angle bin » → - 6,4 %

(strong dependence to differences in angular and scene sampling)

Following

to improve nb to bb conversion and Meteosat angular correction

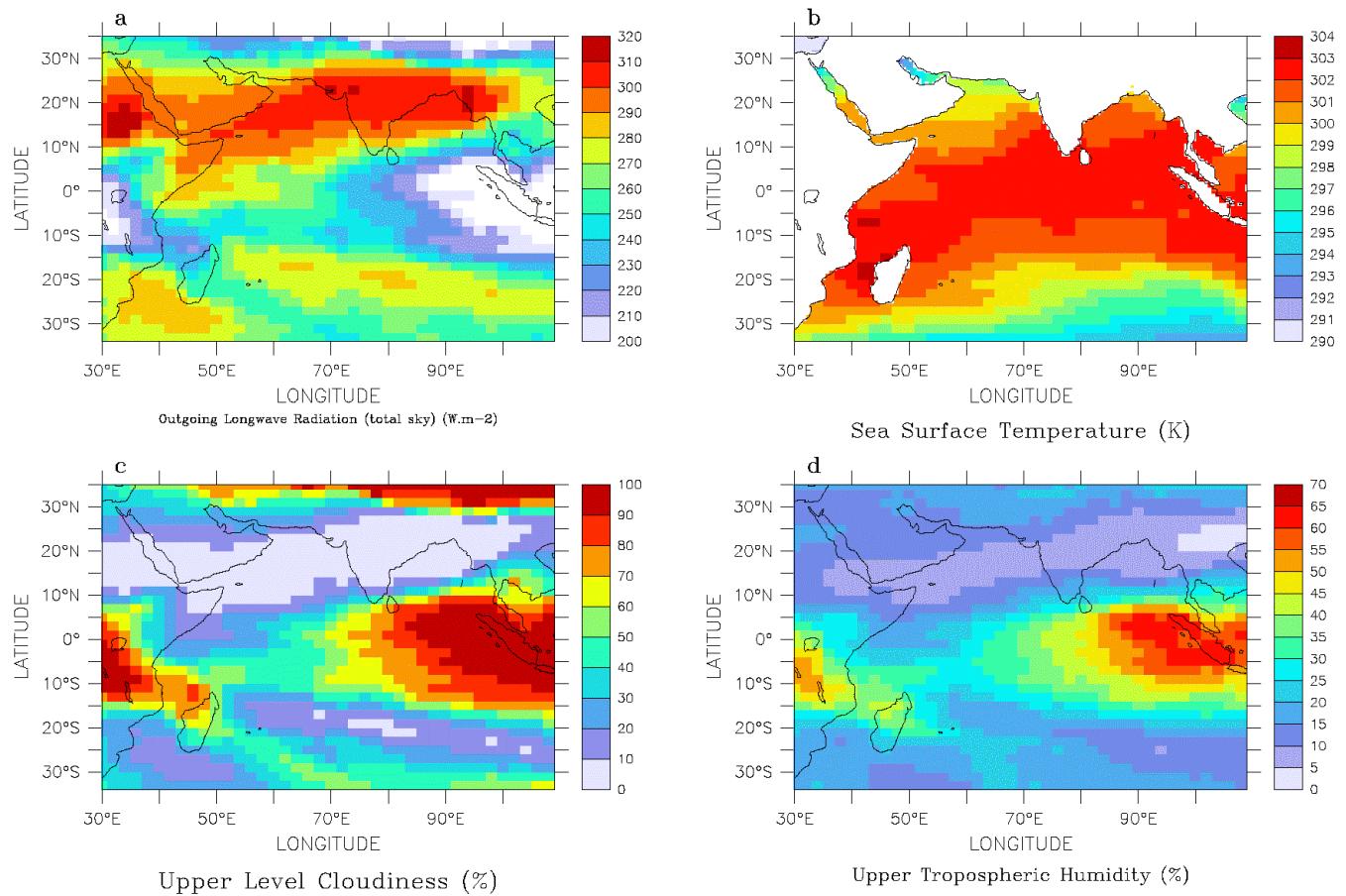
to extend with SSF comparisons

to compute SW monthly means and compare to other diurnal extrapolations

Part 2: characterization of tropical conv

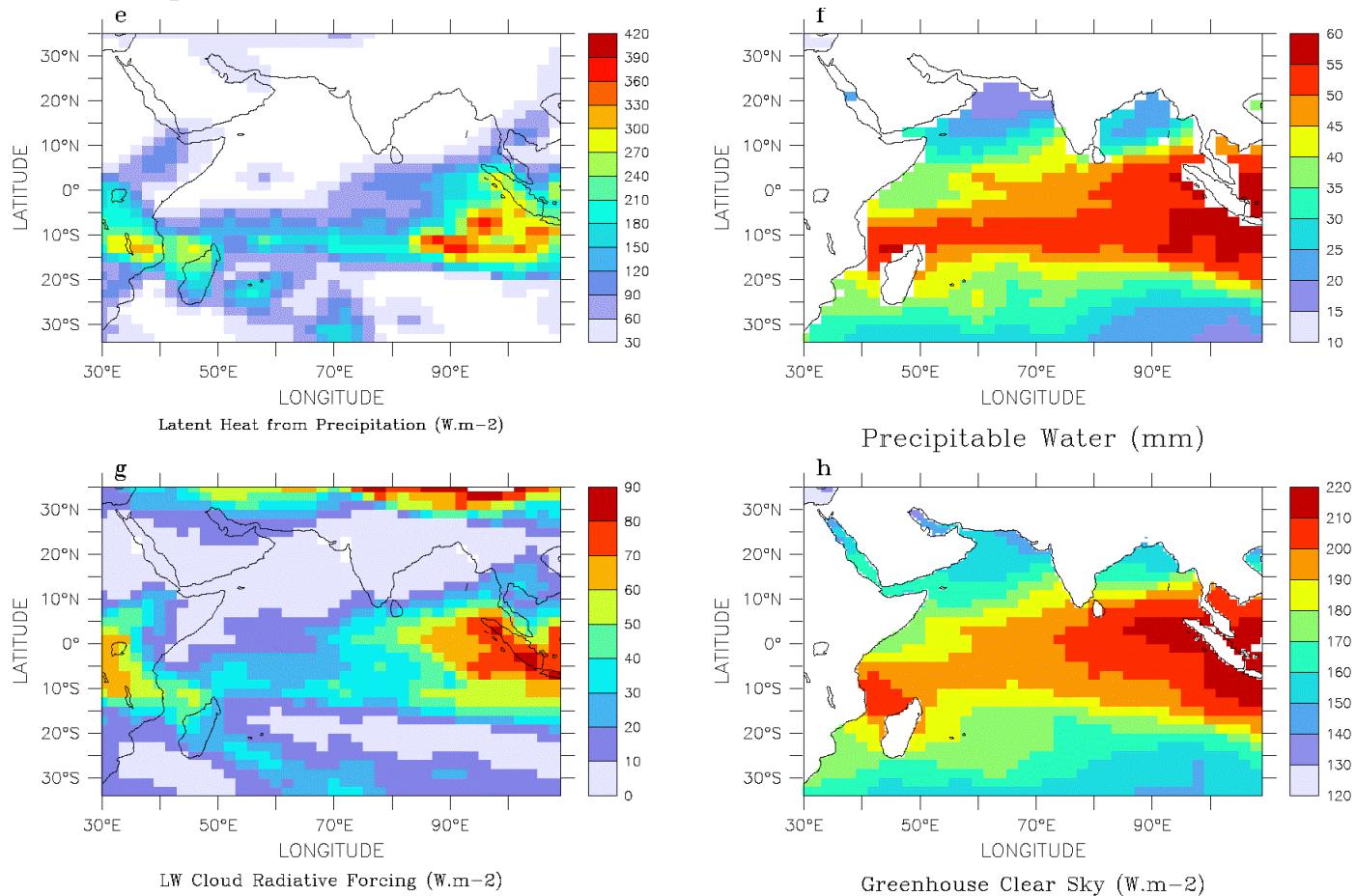
March 1999, LW, SST, ULC, UTH

Locca et al, JGR, in press



March 1999, LHP, PW, LW CRF, Gclear

oca et al, JGR, in press



M. Viollier et al, LMD/CNRS

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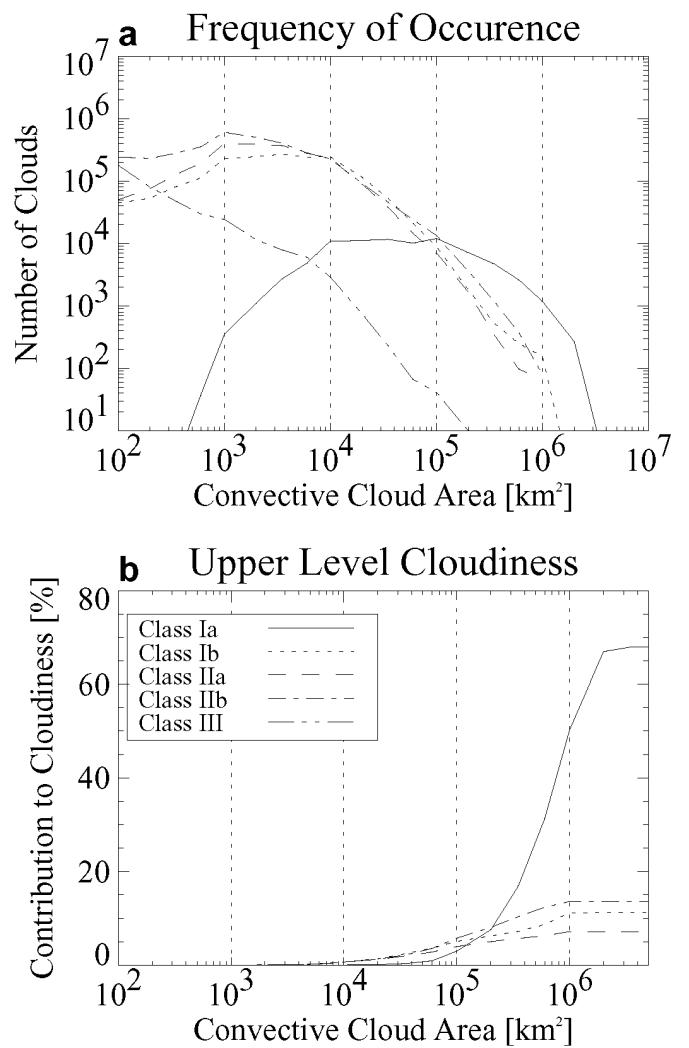
2002/05/15 CERES-26

frequency of occurrence of convective systems,
 cumulated contribution to cloudiness
 as function of the convective cloud area.

The five categories of convective systems. T_{IRmin} is the minimum infrared
 brightness temperature of the cloud system.

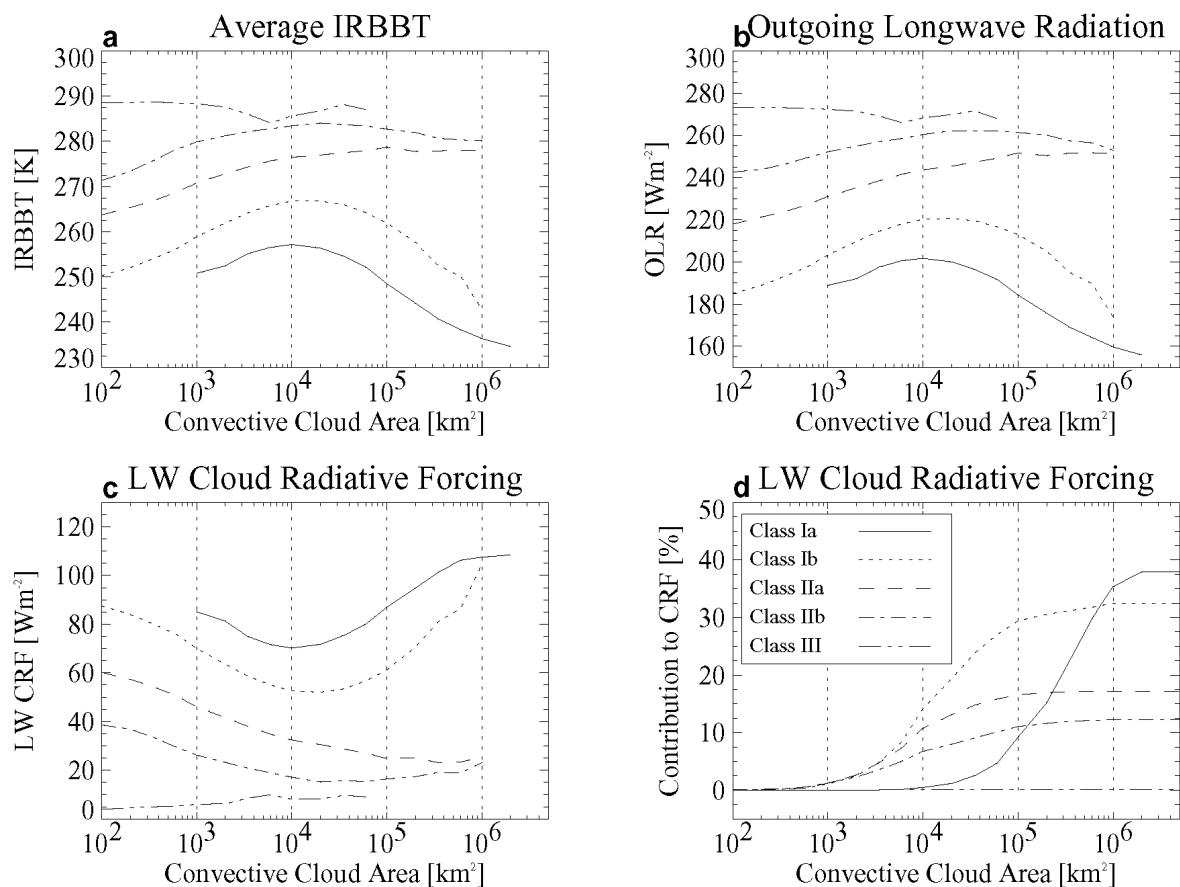
Category	Temperature criterion	Comments and naming convention
Ia	$T_{IRmin} < 210\text{K}$	Very Deep convection
Ib	$210\text{K} \leq T_{IRmin} < 240\text{K}$	Deep convection
IIa	$240\text{K} \leq T_{IRmin} < 255\text{K}$	Mid tropospheric convection & Debris
IIb	$255\text{K} \leq T_{IRmin} < 270\text{K}$	Low to mid troposphere & Debris
III	$T_{IRmin} \geq 270\text{K}$	Detached thin cirrus

Roca et al, JGR, in press



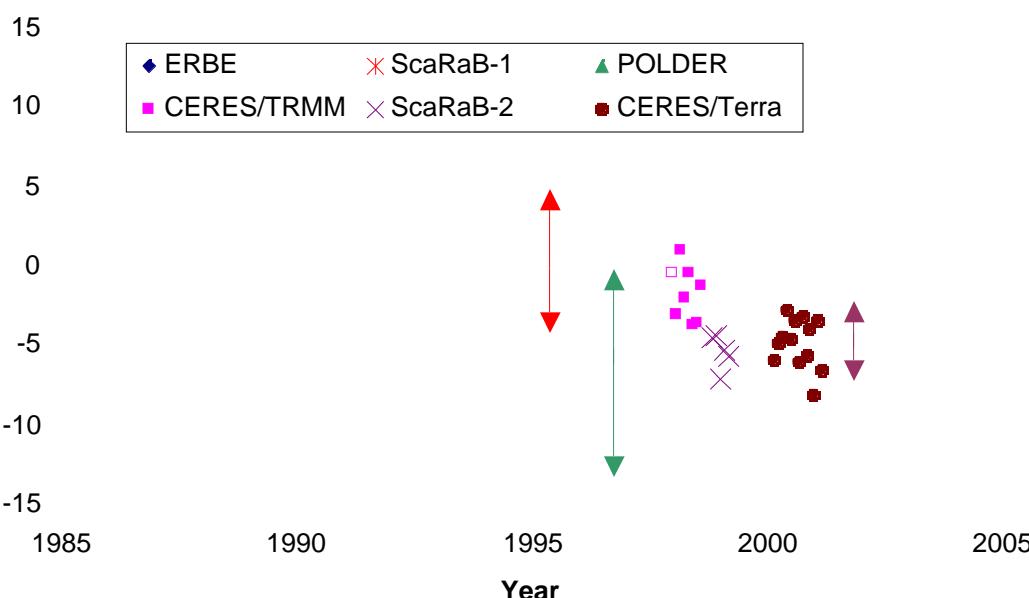
Convective system radiative properties as a function of the convective cloud area.

to convection:
and mean
temperature cools as the
cloud area increases



Part 3: information on POLDER and Megha-T1

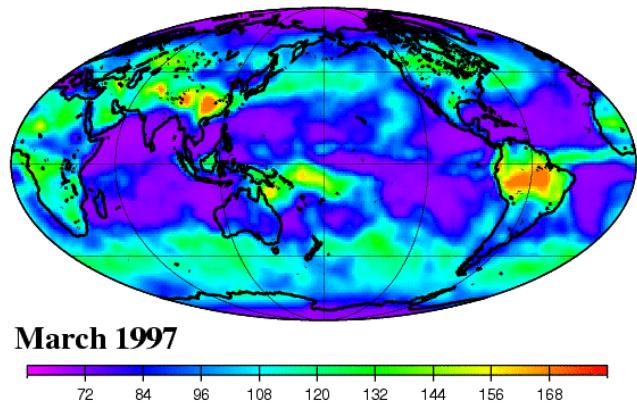
20S-20N anomalies referenced to 1985-1989 monthly means



Uncertainties W/m²

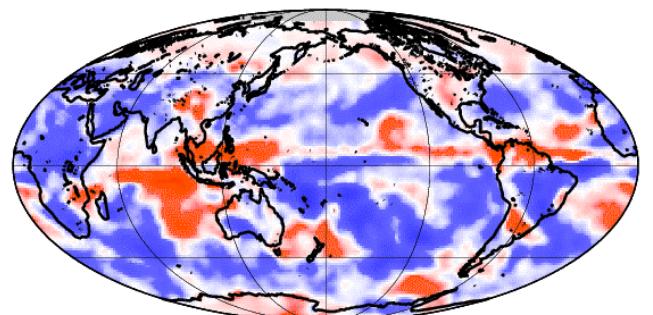
	ERBS-NS	ScaRaB	Ceres	Pole /Terra
Calibration	0.5	2.5	1.5	5
Spectr C.	ε	ε	ε	4?
Ang C.	ε	ε ?	ε ?	ε ?
Diu C.	1.7	4.0	3.0	3.0
All	1,8	4.7	3,4	7.0

SW Flux (Polder/Adeos1)

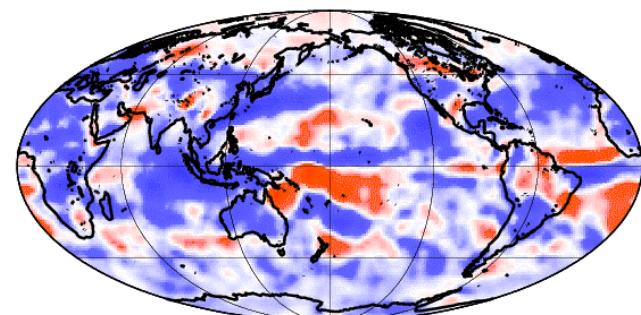


SW reflected flux density (Wm^{-2}) for March 1997 (POLDER/ADEOS).

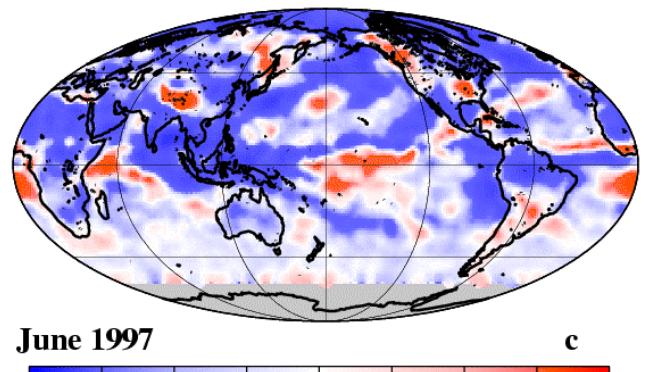
SW reflected flux density anomalies (Wm^{-2}) for (a) February, (b) March 1997, and (c) June 1997, referenced to the 1985-1989 ERBE monthly means



a



b



c

Indo-French Megha-Tropiques Mission : Convective systems, water cycle and energy budget in the tropical atmosphere

launch planned for mid-2006 (3 year mission), most probably mid-2007
(PROTEUS platform, PSLV rocket)

Orbit : low inclination on the equatorial plane (20°); altitude 870 km
Instruments

MADRAS : a microwave imager mainly to study precipitation and cloud properties, including ice at the top of clouds. (SSM/I type, with an additional channel at 157 GHz)
SAPHIR a microwave sounding instrument for retrieving the 3D distribution of atmospheric water vapor (6 channels in the 183 GHz band).

ScaRaB : the spare model of the russian experiment with refurbished electronic block
No change in the optical head except the ability to in-flight intercomparison
of channel SW and T by switching the silicate filters.

Peer review for ScaRaB : 30/4/2002, decision to continue; some issues (the vibration resistance,...); next peer review : 01/2003.

<http://cet.lmd.polytechnique.fr/MT/>